

# CLAIMS

1. A catheter comprising:

5 a shaft segment, said shaft segment including a proximal end of the catheter and a shaft segment central axis, wherein said shaft segment comprises a shaft segment uptake lumen and a shaft segment return lumen;

10 a distal end segment coupled to the shaft segment, said distal end segment including a distal end of the catheter and a distal end segment central axis, wherein said distal end segment comprises a distal end segment uptake lumen and a distal end segment return lumen, further wherein said distal end segment uptake and return lumens are coupled to said shaft segment uptake and return lumens, respectively;

wherein said distal end segment central axis forms a non-zero angle with the shaft segment central axis when said catheter is in its unstressed configuration.

15 2. The catheter of Claim 1, wherein the non-zero angle is in the range of 5 to 60 degrees.

20 3. The catheter of Claim 1, wherein the non-zero angle is in the range of 5 to 45 degrees.

4. The catheter of Claim 1, wherein the non-zero angle is in the range of 5 to 30 degrees.

25 5. The catheter of Claim 1, wherein said distal end segment uptake lumen and distal end segment return lumen comprise a distal end segment uptake lumen central axis and distal end segment return lumen central axis, respectively.

6. The catheter of Claim 5, wherein the distal end segment uptake lumen central axis and distal end segment return lumen central axis are parallel to the distal end segment central axis.

5 7. The catheter of Claim 5, wherein the distal end segment uptake lumen central axis is parallel to the distal end segment central axis, further wherein the distal end segment return lumen central axis is parallel to the shaft segment central axis.

10 8. The catheter of Claim 5, wherein the distal end segment uptake lumen central axis is parallel to the distal end segment central axis, further wherein the distal end segment return lumen central axis forms a second non-zero angle with the shaft segment central axis.

15 9. The catheter of Claim 1, wherein said distal end segment uptake lumen comprises an uptake hole and said distal end segment return lumen comprises a return hole.

20 10. The catheter of Claim 9, wherein said uptake hole is located proximally with respect to the return hole.

25 11. The catheter of Claim 9, wherein said uptake hole is directed away from a lateral wall of a vessel when the catheter is in the vessel.

12. The catheter of Claim 9, wherein said shaft segment comprises a lateral side wall, further wherein said uptake hole is directed away from the lateral side wall such that a separation is maintained between a lateral wall of a vessel and said uptake hole when the catheter is in the vessel and the lateral side wall abuts the lateral wall of the vessel.

13. The catheter of Claim 9, wherein said distal end segment return lumen comprises a return lumen end segment, further wherein said return lumen end segment maintains a separation between a medial wall of a vessel and said uptake hole when the catheter is in the vessel.

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14. The catheter of Claim 9, wherein said distal end segment return lumen comprises a return lumen end segment, further wherein said return lumen end segment shields the uptake hole from a medial wall of a vessel when the catheter is in the vessel.

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15. The catheter of Claim 11, wherein said uptake hole is medially oriented with respect to the lateral wall of the vessel.

16. The catheter of Claim 1, wherein the catheter is comprised of a flexible plastic material.

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17. A catheter comprising:

a shaft segment, said shaft segment including a proximal end of the catheter and a shaft segment central axis;

a distal end segment coupled to the shaft segment, said distal end segment including a distal end of the catheter and a distal end segment central axis;

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wherein said distal end segment central axis is parallel to the shaft segment central axis when said catheter is in its unstressed configuration, further wherein said distal end segment comprises a return lumen and an uptake lumen having a return lumen distal end and an uptake lumen distal end, respectively, further wherein the uptake lumen distal end is terminated by a closed surface, further wherein the uptake lumen distal segment includes only one side hole.

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18. The catheter of Claim 17, wherein said shaft segment comprises a shaft segment uptake lumen and a shaft segment return lumen, further wherein said shaft segment uptake and return lumens are coupled to the distal end segment uptake and return lumens, respectively.

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19. The catheter of Claim 17, wherein said distal end segment return lumen comprises a return hole, further wherein said only one side hole is located proximally with respect to the return hole.

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20. The catheter of Claim 17, wherein said one side hole is directed away from a lateral wall of a vessel when the catheter is in the vessel.

21. The catheter of Claim 20, wherein said one side hole is medially oriented with respect to the lateral wall of the vessel.

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22. The catheter of Claim 17, wherein the catheter is comprised of a flexible plastic material.

23. A catheter comprising:

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an uptake lumen including an uptake lumen shaft segment and an uptake lumen distal segment with an uptake lumen distal end;

a return lumen including a return lumen shaft segment and a return lumen distal segment with a return lumen distal end;

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wherein the uptake lumen shaft segment is substantially parallel to the return lumen shaft segment, further wherein at least a portion of the return lumen distal segment is helically coiled around the uptake lumen distal end.

24. The catheter of Claim 23, wherein said uptake lumen distal end segment comprises an uptake hole and said return lumen distal end segment comprises a return hole, further wherein said return hole is located distally with respect to the uptake hole.

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25. The catheter of Claim 23, wherein the return lumen end segment comprises a portion parallel to the uptake lumen end segment and disposed more distally than the uptake lumen distal end.

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26. The catheter of Claim 23, wherein said uptake lumen distal segment includes an uptake lumen end hole at the uptake lumen distal end, further wherein said portion of the return lumen distal segment helically coils 360 degrees about the uptake lumen end hole.

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27. The catheter of Claim 26, wherein said portion of the return lumen distal segment shields the uptake lumen end hole from a blood vessel or atrium wall when said catheter is disposed in a blood vessel or atrium.

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28. The catheter of Claim 23, wherein the catheter is comprised of a flexible plastic material.